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November 24, 1998

Ms. Magalie R. Salas, Secretary  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

In re: CC Docket No. 98-42 (RF Lighting Devices)  
Ex Parte Communication

Dear Ms. Salas:

On November 23, 1998, Peter Murray and the undersigned representing Ericsson Inc., met with Karen Gulick of the Office of Commissioner Tristani to discuss issues related to the Notice of Proposed Rule Making in the proceeding described above. Also in attendance at the meeting were Mr. Jim Zyron of Harris Corporation and Mitchell Lazarus, Esq. representing Harris Corporation, 3 Com and Symbol Technologies.

Ericsson described the Bluetooth Special Interest Group which is comprised of more than 200 companies world wide who are developing Part 15 wireless unlicensed devices to be used to connect PCs and wireless phones including, but not limited to, cellular and PCS phones. Bluetooth devices will be marketed throughout the world. Ericsson expressed the view that deployment of RF Lighting devices with unlimited RF power could cause significant interference to unlicensed Part 15 devices operating in the 2.4 GHz ISM band. Ericsson described how operation of RF Lighting devices would adversely impact a number of proposed Bluetooth applications including wireless hands-free devices to be used in vehicles.

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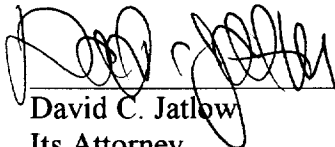
Ms. Magalie R. Salas  
November 24, 1998  
Page Two

Attached is a copy of the written material Ericsson provided to Ms. Gulick which describes Bluetooth. Also attached is a copy of a November 19, 1998 written ex parte presentation Ericsson submitted in this docket which was provided to Ms. Gulick.

An original and one copy of this letter is being submitted for inclusion in the docket in this proceeding. A copy is also being hand delivered on this date to Ms. Gulick.

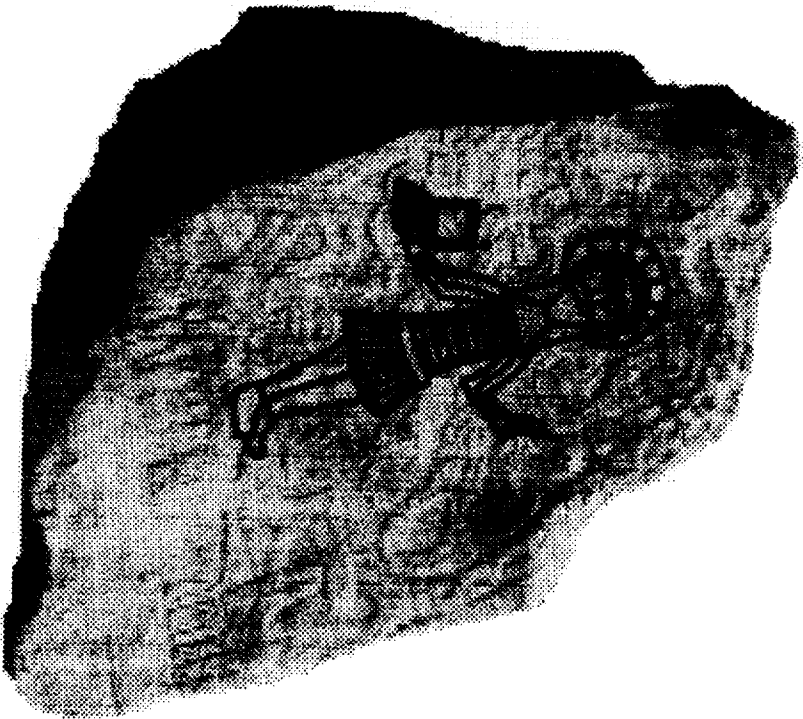
Respectfully submitted,

Ericsson Inc.

  
\_\_\_\_\_  
David C. Jatlow  
Its Attorney

cc: Karen Gulick, Esq.

Interest Group



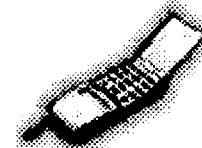
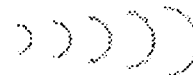
# ***Bluetooth Usage Examples***

# *The Brief Case Trick (hidden computing)*

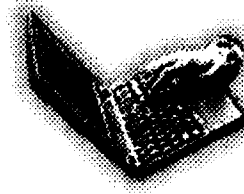
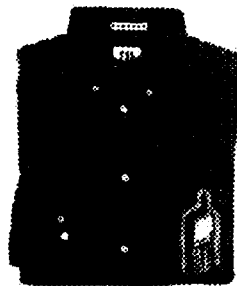


- ❑ **Laptop in briefcase**
  - ▼ E-mail alert through phone
  - ▼ Browse E-mails in phone
- ❑ **Phone off (in airplane)**
  - ▼ Answer mail on laptop
  - ▼ Send mail from phone or laptop at arrival

@



@





# The Internet Bridge

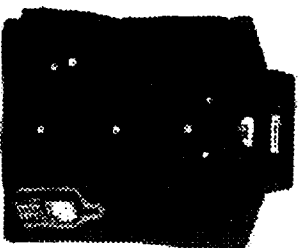


## ☐ Mobile browsing

- ▼ on the go
- ▼ in the office
- ▼ in the car
- ▼ in the sofa



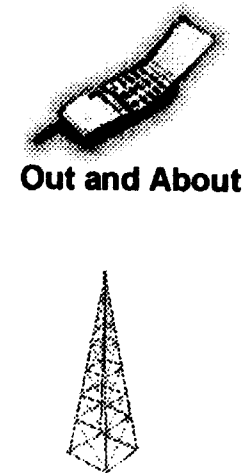
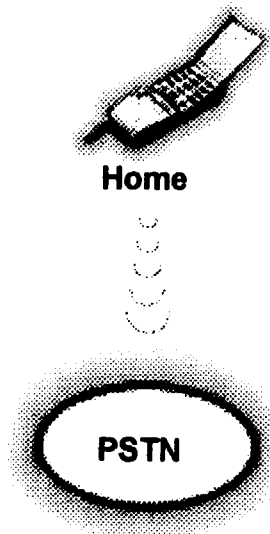
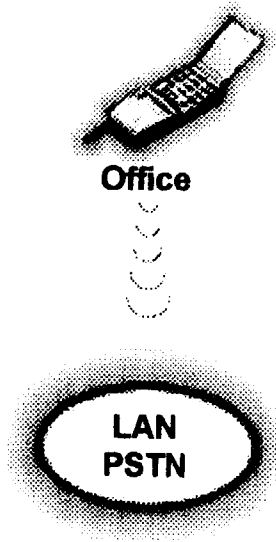
PSTN  
ISDN  
LAN  
xDSL



# The Three In One Phone

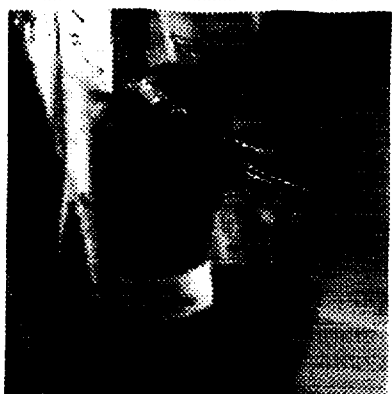
## ❑ One Phone three functions

- ▼ Intercom (no telephony charge)
- ▼ Portable (fixed line charge)
- ▼ Cellular (cellular charge)



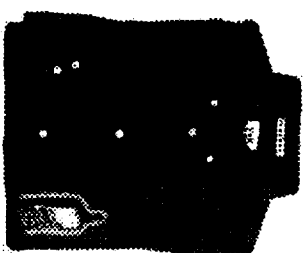


# The Ultimate Headset



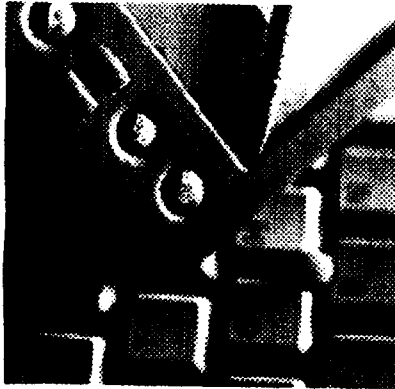
☐ Keep your hands free with  
the ultimate solution for  
the:

- ▼ Road
- ▼ Office
- ▼ Car



# *The Synchronizer (hidden computing)*

Interest Group



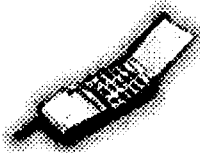
## ☐ Background synchronisation

▼ PC-PDA

▼ PC-HPC

▼ Phone-PC

▼ etc.....

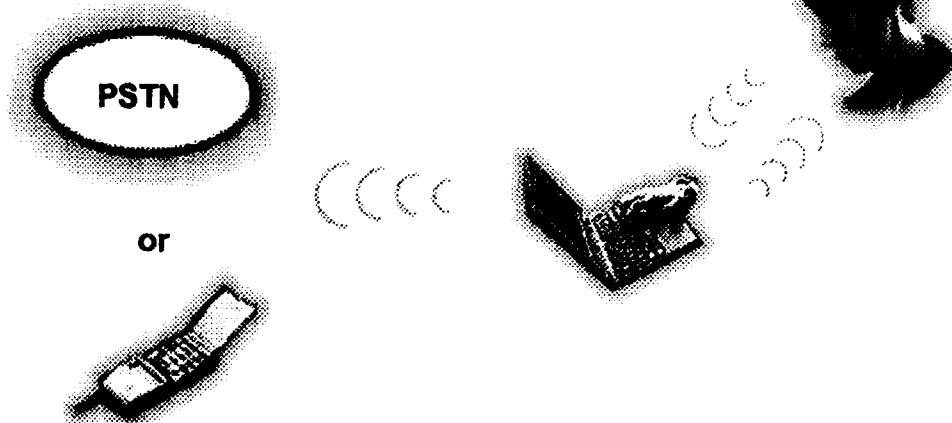
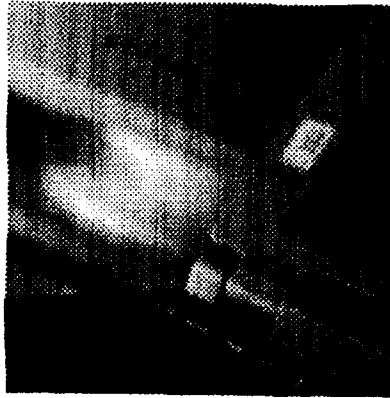




# ***The Speaking Laptop***

## ☐ **Use the laptop as a speaker phone**

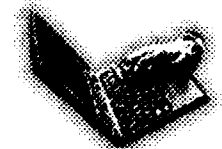
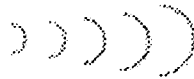
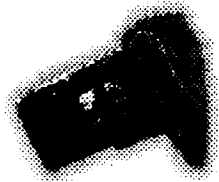
- ▼ In the office
- ▼ On the road
- ▼ At home



# *The Instant Postcard*

- ❑ **Send instant postcards and video clips**

- ▼ Add comments with phone keyboard or PDA
- ▼ Personal and professional use



GSM  
D-AMPS  
PSTN  
etc....

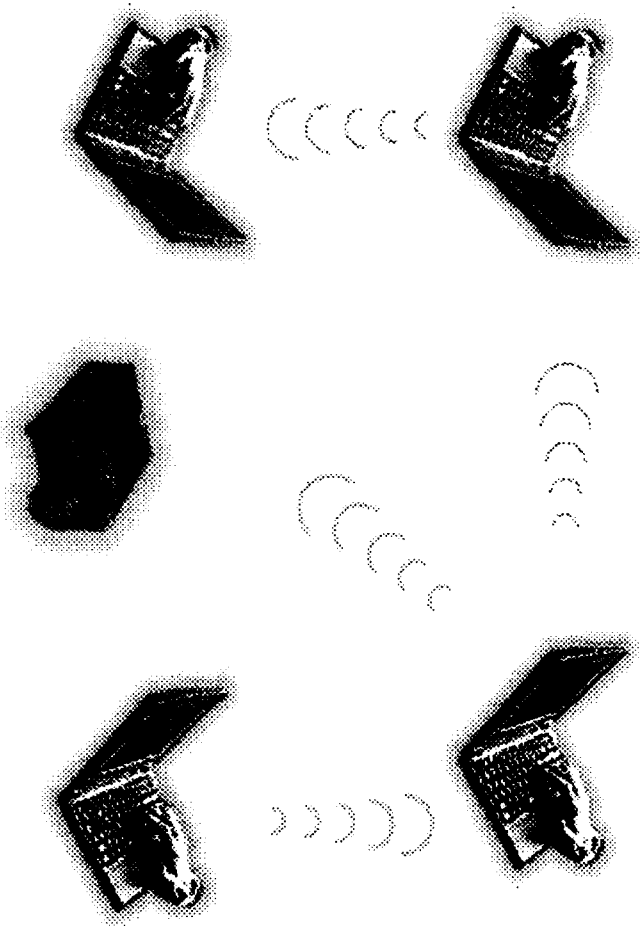


Special Interest Group



# The Conference Table

- ❑ Share and exchange data in the meeting room



# Bluetooth Features & Benefits

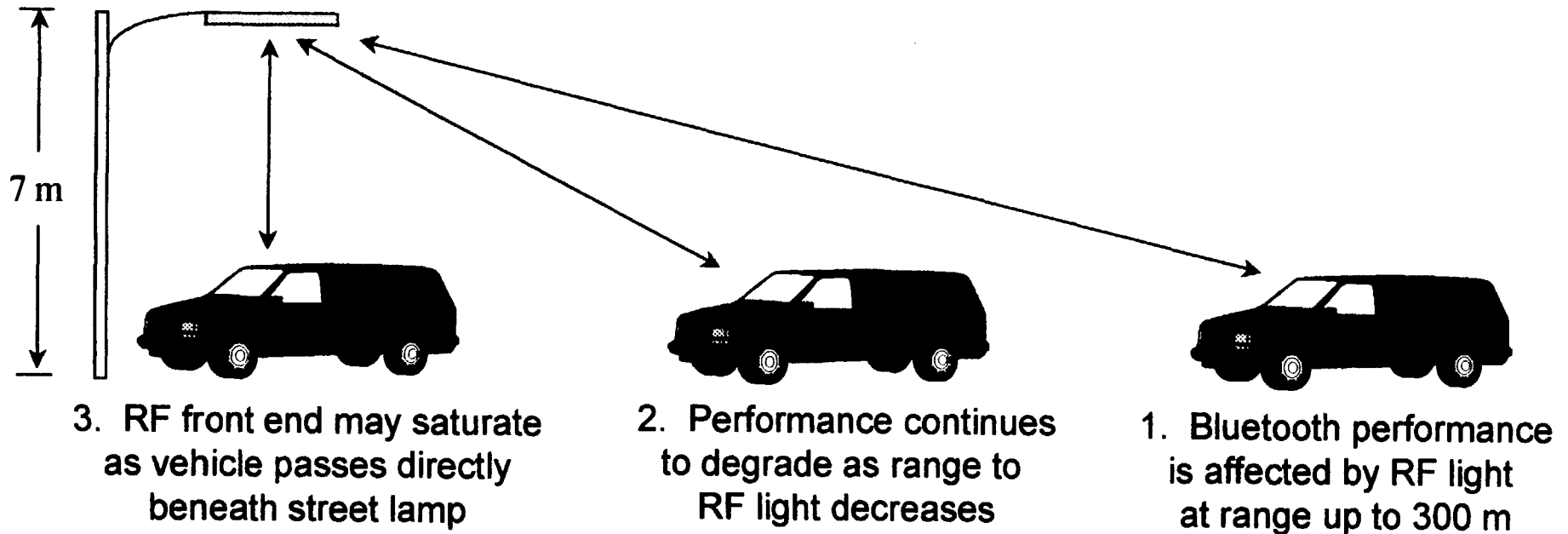
- ▶ **2.45 GHz FHSS low cost, low power radio**
- ▶ **Provide wireless connectivity between cell phones, laptops, peripherals, etc.**
  - ▼ enable automatic download of e-mail from wide area cellular network to portable computing device
  - ▼ TDMA voice capability
  - ▼ Possible usage includes means to shutdown cell phones on commercial aircraft
  - ▼ enables hands-free operation of cell phones via a wireless driver headset

# Hands Free Cell Phone Operation

## ► **Scenario: RF Lighting installed on public roadways**

- ▼ RF emitter (light) mounted on pole 7 m to 10 m above roadway
- ▼ can radiate up to 3W (+35 dBm) in 2.45 GHz band
- ▼ Begins to degrade Bluetooth link at range up to 300 meters
- ▼ Performance continues to degrade as range between RF light and Bluetooth receiver decreases.
- ▼ Bluetooth receiver front end may saturate directly below light tower (radio temporarily rendered inoperable).
- ▼ There may be many street lamps within 300 meters

# Hands Free Cell Phone Operation



- **Bluetooth link performance could be affected by RF lighting**
- **Degree of degradation depends on proximity to lighting device**
- **Many lights might be within range (300 m) of a given point**

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November 19, 1998

Ms. Magalie R. Salas, Secretary  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, D.C. 20554

In re: ET Docket No. 98-42 (RF Lighting Devices)  
Written Ex Parte Communications

Dear Ms. Salas:

Attached hereto, on behalf of the Bluetooth Special Interest Group is a written ex parte presentation for inclusion in the record of the above-referenced proceeding.

The written ex parte presentation notes that adoption of rules proposed in ET Docket No. 98-42 may cause harmful interference to Part 15 devices operating in the 2.45 GHz ISM band. The presentation describes such a scenario when Part 15 devices, such as Bluetooth devices operating in vehicles, are in the proximity of RF Lighting devices which are located along a highway. It should be noted, however, that RF Lighting devices will be used in a wide variety of environments, including but not limited to, conference centers, near schools and in residential and commercial neighborhoods. Thus, the potential for harmful interference to be created to a wide variety of Part 15 devices in a wide variety of indoor and outdoor residential and commercial environments, is substantial.

Copies of this written material are being delivered this day to Chairman Kennard, Commissioners Ness, Furchtgott-Roth, Powell and Tristani, Mr. Dale Hatfield, Mr. Julius P. Knapp, Ms. Karen Rackley, Mr. John Reed and Mr. Anthony Serafini.

Respectfully submitted,



David C. Jatlow  
Counsel for Ericsson Inc.

Magalie R. Salas  
Secretary  
Federal Communications Commission  
1919 M Street NW  
Room 222  
Washington DC 20554  
USA

Cc: Chairman William E. Kennard  
Commissioner Susan Ness  
Commissioner Harold Furchgott-Roth  
Commissioner Michael K. Powell  
Commissioner Gloria Tristani  
Dale Hatfield  
Julius P. Knapp  
Karen Rackley  
John A. Reed  
Anthony Serafini

BLUETOOTH Promoters comments on the ET Docket No. 98-42

The Bluetooth Special Interest Group (SIG) is a consortium, with founding members (Promoters) Ericsson, Intel, Nokia, IBM and Toshiba. The consortium was formed in the beginning of 1998 to promote a technology for short-range wireless connectivity. Our technology, code named Bluetooth, is intended to be a "cable replacement" operating in the 2.45 GHz ISM band under Part 15 at an output power of maximum 100 mW, giving a range of roughly 100 meters.

Designed for the 2.45 GHz ISM band will allow global usage of the Bluetooth system. The promoters have committed to integrate the Bluetooth system in their products, which include cellular phones, personal computers etc.

The Bluetooth Promoter companies have invited other companies to sign an Adopters Agreement in order to acquire a free license to the Bluetooth System Specification. So far more than 220 companies have signed this agreement, which makes the Bluetooth Special Interest Group the largest initiative for a new technology, merging the telecom and computer industry.

The list of Adopters (see Appendix A) contains a lot of major corporations from all parts of the world as well as smaller emerging businesses.

As can be seen from this list the Adopter companies represent many different businesses, also outside the telecom and computer area. This indicates that Bluetooth has a great potential to be a true ad-hoc standard for wireless connectivity in the office, in the home or while travelling. Applications will target both businessmen and the public.

The Commission has in April this year released a Notice of Proposed Rule Making, under ET Docket No. 98-42, which propose amendment of Part 18 of the Commissions Rules to update the regulations for RF Lightning Devices. The Bluetooth system is designed based on the understanding that we have to cope with interference from other systems sharing the band with us. Bluetooth uses Frequency Hopping Spread Spectrum (FHSS) with 79 hopping channels and a hop rate of 1600 hops/s. We also employ a speech coding algorithm, known as Continuous Variable Slope Delta modulation (CVSD), which provides a graceful degradation. However, we feel that the approval of ET Docket No. 98-42 for RF Lightning Devices will increase the interference to other systems beyond what was originally considered, when Part 18 ISM devices were allowed to radiate unlimited RF power.

Apart from Bluetooth, there are also other systems targeting use of the 2.45 GHz ISM band. IEEE 802.11 Wireless LANs are becoming more popular and there are other new communication technologies emerging, targeting the 2.45 GHz operation according to Part 15. Bluetooth and other communication systems must share the spectrum with Part 18 ISM devices. The most widely used ISM device is probably the  $\mu$ -wave oven. However, in our opinion there is a very strict difference between RF Heating devices, like  $\mu$ -wave ovens and RF Lightning Devices. The former is installed in specific and generally known locations, like restaurants and in many private households, while RF Lightning devices can be installed both indoor and outdoor, in both private and public places. Another, very important difference is that while RF Heating devices operate with a duty cycle in the order of 1 % during a day, RF Lightning Devices will in many applications operate continuously.

With a maximum deployment scenario for RF Lightning devices (outdoor and indoor), it is probable that the interference level created, will significantly reduce the capacity of communication systems like Bluetooth, IEEE 802.11 WLAN and other Part 15 systems.

The Bluetooth Promoters would like the Commission to postpone the approval of ET Docket No. 98-42 until further investigations have been done on the effect of unlimited radiated power from part 18 RF Lightning devices on Part 15 communication systems. If in such studies indeed is found that RF



Lightning devices will create an interference level, which significantly degrades performance of part 15 devices, like Bluetooth, then we ask the Commission to deny approval of the proposed Amendment to Part 18 or to put limitations on radiated power from RF Lightning devices in the 2.45 GHz ISM band. If this is not considered there is a risk that the public can not benefit from the wide range of applications that Bluetooth can provide.

The investments made in existing systems like IEEE 802.11 and emerging new technologies like Bluetooth, in the next few years is in the order of Billion USD. These investments should be protected by careful investigations of the probable major increase in interference level in the 2.45 GHz ISM band spectrum, caused by new part 18 devices like RF Lightning devices.

To show the effect that RF Lightning devices probably will have on Bluetooth devices the following user scenario is presented. This is just one of the many scenarios for usage of a "cable replacement" system like Bluetooth. It is also not a worst case situation for coexistence of RF Lightning devices and Bluetooth.

#### User Interference Scenario

Bluetooth head set used as a Hands Free unit for a cell phone. The user is driving his car on a public road, where RF Lightning devices are mounted on poles. The following is the assumed characteristic of the RF Lightning device:

- Located at the top of a pole 7 meters above the road
- Leakage output power 3 W (+35 dBm). This is probably a quite conservative number. It has been very hard to retrieve information about the true leakage power of actual RF Lightning devices.
- Frequency band: 2450 +/- 50 MHz. Spectral bandwidth not known but assuming similarity with microwave ovens give nominal bandwidth less than 500 kHz. Due to power supply design, the radiated energy will in many cases sweep across the band.

The following is the simplified characteristics of the Bluetooth system:

- C/I = 14 dB (Co-channel)
- Output power,  $P_B = 0$  dBm. With optional power control even lower depending on distance, down to -30 dBm.
- Distance head set to cell phone = 1 m.

Assuming free space propagation, the path loss from light pole to car ( $L_L$ ) and from head set to cell phone ( $L_B$ ), can be calculated:

$$L_B = 20 \log(4\pi D/\lambda) : D=1 \text{ m} : f= 2450 \text{ MHz} : \Rightarrow L_B = 40 \text{ dB}$$

The Limiting interference level ( $I_B$ ) at Bluetooth receiver front-end (start of performance degradation) is then derived as:

$$I_B = P_B - L_B - (C/I) = -55 \text{ dBm}$$

It is now possible to calculate at what distance  $D_L$  from the light pole (where the RF Lightning device is placed), the interference level  $I_B$  is reached:

$$L_L = 35 - (-55) = 90 \text{ dB} \Rightarrow D_L = 308 \text{ meters.}$$

Now let's assume that the car is driven directly under the light pole with the RF Lightning device and let us calculate the interfering level in the car,  $I_L$

$$I_L = 35 - 57 = -22 \text{ dBm (free space propagation, 7 meters distance)}$$

#### Conclusion

From the above simple, but far from worst case scenario, it is shown that the interference levels generated from RF Lightning devices, operating continuously for many hours, is likely to cause degradation to systems like Bluetooth, even if this system employs frequency hopping, because:

- Within a 300-meter radius there is likely to be many RF Lightning devices, operating at different frequencies and therefore degrading multiple channels in the frequency band for part 15 devices.

- Interference levels closer to the emitting RF Lightning device may block the front-end in the receiver in Part 15 devices like Bluetooth and prevent operation.
- The above calculation assumes that the wanted signal level at the Bluetooth receiver input is in the order of -40 dBm. In fact, with power control and a reference sensitivity level of -70 dBm, the power at the receiver input will often be much lower than -40 dBm, thus increasing the risk of interference. It should be noted that the Bluetooth system is designed to be less susceptible to interference than many other systems, yet it is probable that considerable degradation is the result of the above-described scenario.

Respectfully Submitted  
On behalf of the Bluetooth Promoters

**Anders Svensson** M.Sc. EE  
Manager - Certification & Verification  
Short Link Technology

**Ericsson Mobile Communications AB**  
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Nya Vattentorget Mobile: +46 70 5901023  
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Email: [anders.svensson@ecs.ericsson.se](mailto:anders.svensson@ecs.ericsson.se)

## APPENDIX A

The following companies have joined the Bluetooth Special Interest Group from the launch events in May 1998 until November 1998:

3Com (Palm, Megahertz, 3com, USR)  
AB Transistor  
Acer America  
Acer Peripherals Inc.  
Adaptive Solutions  
ADBS Corporation  
Adherent Systems Ltd  
Advanced Micro Devices  
Agent Systems, Inc.  
AKG Acoustics GmbH  
Alantro Communications  
Alps Electric Co.Ltd  
Ambit Microsystems Corp.  
AMP Wireless Systems  
Analog Devices  
Ann Arbor Electrogram Libraries  
APT Technologies, Inc  
AR Design Inc  
ArcSecond, Inc.  
ARM Ltd.  
Ascom  
Asulab SA  
ATL Research A/s  
Atmel Corporation  
Atmosphere Pty Ltd  
AU System  
Axis  
Bang & Olufsen Telecom A/S  
Bar-Mail AB  
Berkeley Concept Research Corp  
Biosys AB  
Bitstream AB  
BreezeCom Ltd  
Butterfly, VLSI Ltd  
C Technologies  
C-One Technology Corp  
Cable + Wireless Communications  
California Eastern Laboratories  
Cambridge Consultants Ltd  
CAPCAD AB  
Caring Technologies  
Casio  
Celcius Research Ltd  
Celsius Testsystems AB  
Centura Software Corp  
Cepcon GmbH  
CETECOM GmbH  
Cirrus Logic  
ComBit Inc  
CommAccess Technologies, Inc  
Compaq Computer Corp  
Convergence Corporation  
Cooperative Research Centre Broadband Telecommunications  
Cosmic Co.Ltd  
Creative Digital Publishing, Inc

CRONUS-V  
Crystal  
D.S.R. Ltd  
Dassault Electronique  
Data Hunter  
Datum Telegraphic Inc  
Daugherty & Associates  
Dell Computer Corp  
Depelopment Corp  
Desktop Products  
Digianswer A/S  
Digihouse  
Domsilica  
Dynamical Systems Research Ltd  
E-Ink  
ECSAB  
EIMC  
Electromagnetic Science  
Elektronikhuset  
ELSA AG  
Eltex  
Elvior OU  
Embedded Design Specialists Inc  
Enator  
Enserve  
Ensure Technologies  
Eureka Technologies. Ltd  
Everex Systems Inc  
Extended Systems  
FAB Systems  
Geoworks  
GN Netcom AS  
Hand Held Products  
Harris Corporation  
Hasselblad  
Hayes Microcomputer Products  
Hewlett-Packard Co  
Hong Kong Telecommunications Ltd  
Hosiden Corp  
Hotline  
HPM Industries Pty Ltd  
iCOM Inc  
ID express Oy  
Informed Technology Inc  
InnoLabs Corporation  
Innovative Global Solutions  
Institut für Halbleiterphysik Frankfurt (Oder)  
Institute for Information Industry  
Integral Design  
Integrated Communications  
Intelli Worxx  
Intellicom  
Intermec  
Internet Solutions for Business  
Inventec Electronics Co. Ltd  
Inventel Systems  
Invision IT Systems Pty Ltd  
iReady Corp  
Istari Design  
JABRA Corporation

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Japan Aviation Electronics  
JavaSoft  
Jeeves Telecom Ltd  
Jenkins Technologies  
Jenkins Technology  
Jep Electronics  
Johnson Controls  
Keycorp Ltd  
KVASER AB  
Linkup Systems Corp.  
Linköping University  
Live Media Pty Ltd  
Logitech SA  
Logivox Software, Inc  
Lucent Technologies UK Limited  
Luxsonor, Inc  
M P Kelly Medical P/L  
Mainbrace Corp  
Materials Corp  
Maxim Integrated Products, Inc  
MECEL AB  
Media Options  
Metricom  
Microlise Eng  
Minec Systems  
Mining Industry Resources  
Mistral Int'l Pty Ltd  
Mitel Semiconductor  
MITRE Corporation  
Mitsubishi  
Mitsubishi Electric Co  
Mobilink Telecom, Inc  
Motorola  
MP Kelly  
MPC  
National Semiconductor Corp  
NCR Corporation  
NeoParadigm Labs, Inc  
NERA ASA  
Netport Systems P/L  
NGK Spark Plug Co. Ltd. / NTK Technical Ceramics  
NTT DoCoMo  
Olicom, Inc  
one2one  
Option International  
Optionexist Ltd.  
Ortivus AB  
Oticon A/S  
PC Card International AB  
PCS PC-Systeme GmbH & Co.KG  
Personal Electronic Devices, Inc  
Philips  
Philsar Electronics, Inc  
Phoenix Technologies Ltd  
Phonak AG  
Physio-Control  
Pin Point Corporation  
Plantronics  
PLEXTEC Ltd  
Polar Electro Oy

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Pretec Electronics Group  
Primax Electronics Ltd  
Protocol  
Proxim Inc  
PSDB  
Psion Computers PLC  
Psion Dacom PLC  
Puma Technologies  
Quadriga Lda  
Qualcomm. Inc  
Quanta Computer Inc.  
Radio Design Ltd  
RadioLAN  
Ratio  
Research Media & Marketing Consultants  
Resound Communications  
RF Micro Devices  
RF Monolithics. Inc  
RightNet. Inc  
RStream Communications  
RTX Telecom A/S  
Safelink Technologies Inc  
Samsung Electronics Ltd  
SE Communications  
Seiko Epson Corporations  
Sharp Corp  
Shockfish  
Siemens Försvarssystem A/S  
Sigma Exallon Systems AB  
Silicon & Software Systems  
Silicon Wave Inc  
Simple Silicon  
SK Telecom  
SKF Nova AB  
Smart Technology Enablers  
SMS Telecom AB  
Socket Communications  
Solomon Wireless Technology  
SolutionNet. Ltd  
Somedic Production AB  
SpaceTime  
Sprint PCS  
SSL  
ST Microelectronics NV  
Stanford Telecommunications Inc.  
Strategic System Resource Group  
Svensk Aktuell Elektronik AB  
Symbian  
Symbionics. Ltd  
Symbol Technologies  
System Innovation AB-Possio  
T-Span System  
T-Span Systems  
TAC AB  
Tacholog  
Tagmaster AB  
TDK  
Ted Liao Consulting  
Tee Pee Nominees  
Teklogix

Telelogic  
Telex Communications  
Telia  
Telital  
Temic Semiconductor  
Texas Instruments  
The Boeing Company  
Thrustfield Programs Ltd  
Traveling Software, Inc  
TTP Communications, Ltd  
Universal Empowering Technologies  
USAR Systems  
Useful Tools  
VADEM Ltd  
Veriteq Instruments  
Via Inc  
Vienna Systems Corporation  
Visteon Automotive Systems  
VLSI Technology, Inc  
Volvo Technological  
VTT Building Technology  
W.C.T Pty Ltd  
Wavecom  
WestLB Panmure  
Widcomm  
Wild Innovations  
WIPRO Limited  
Wireless Solutions Sweden AB  
Wireless logic Int'l Ltd  
Wireless Online  
Wong's Electronics Co. Ltd  
Xemics  
Xircom

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